Putnam (J. J.)

RARE FORM OF

RHYTHMICAL IRREGULARITY

IN THE

ACTION OF THE HEART.

BY

JAMES J. PUTNAM, M. D.,

BOSTON, MASS.

[*REPRINTED FROM THE N. Y. MEDICAL JOURNAL, SEPT.*, 1874.]

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RARE FORM OF RHYTHMICAL IRREGULARITY IN THE ACTION OF THE HEART.[1]

THE accompanying sphygmographic tracings were taken from a man recently a patient at the Massachusetts General Hospital, under the care of Dr. Shattuck, by whose permission the case is published, the facts from which the following sketch was made being taken mainly from the hospital records.

The patient, P. M., presented himself at the hospital for admission, on November 29, 1873, complaining of weakness and stiffness of the legs, so well marked that, even when aided by a cane, he hobbled with difficulty across the floor, having the gait of a rheumatic; also of a dull, grinding pain, referred to the muscles at the back of the left thigh, and to the neighborhood of the hip-joints, especially the left.

He gave the following history:

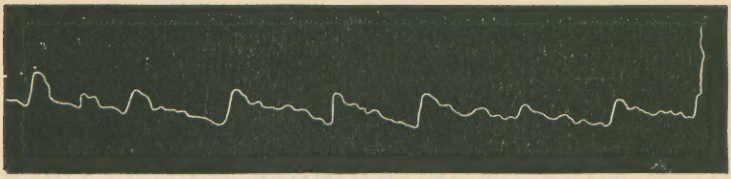
Had been a house-painter for twenty years, but had remained in good health until May, 1873, except for occasional attacks of retention of urine, accompanied with severe pain (he had several of these attacks while in the hospital, where they were believed to be due to chronic prostitis, found on examination by Dr. S. Cabot). His habits had been in all respects temperate.

He had not suffered from colic, except to slight extent, at intervals of a year or so, nor from constipation.

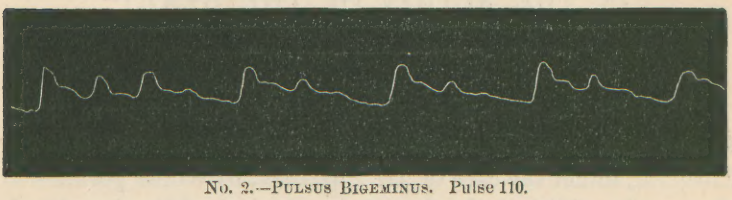
In May, 1873, he began to suffer from want of control over the legs, felt especially in going up and down stairs, and when walking in the dark.

All the muscles of the body, but especially those of the legs, used to tremble violently, especially after he had been sitting still for a time and then tried to rise, and occasionally used to twitch at night, the left more than the right.

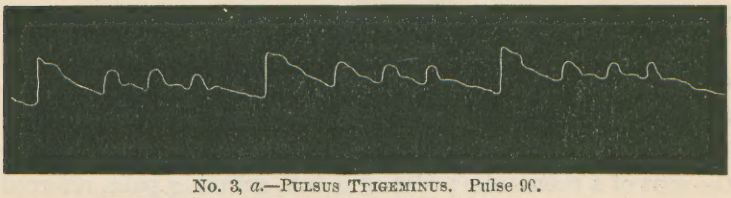
[1] Read before the Boston Society of Medical Sciences.



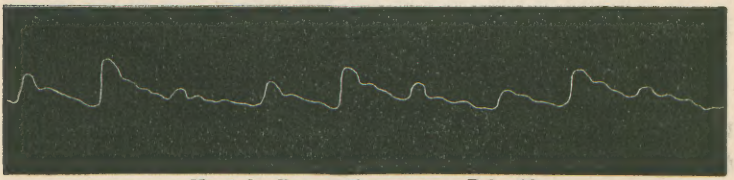
No. 1.—Pulsus Alternans.



No. 2.—Pulsus Bigeminus. Pulse 110.



No. 3, *a*.—Pulsus Trigeminus. Pulse 90.



No. 3, *b*.—Pulsus Trigeminus. Pulse 90.

No. 4, *a*.—Pulse 87.

No. 4, *b*.

Toward the end of July he was attacked suddenly with severe pain in the left thigh, following pretty nearly the course of the great sciatic nerve, and was laid up by it for several weeks. At about this time he began to notice that the action of his heart was very irregular. He used also to feel his pulse from time to time, and states that it was occasionally so feeble as not to be perceptible. Through the summer he was in all respects better, but in the autumn he fell back again.

At his entrance into the hospital (November 29, 1873), it was found that there was no muscular atrophy, nor material modification of the sensibility of the skin, of any part of the body. He could keep his balance perfectly well with his eyes closed, though it required an extra effort. The area of cardiac dullness was of normal extent, and there was no murmur. Two heart-sounds were heard as usual with each beat, the small as well as the large. The arterial tension at the wrist was usually decidedly high.

There was no difficulty in swallowing, in mastication, or in articulation, nor any impairment of the intellect.

The urine contained no albumen, but a good deal of pus and epithelium. It was not examined for lead immediately, but, a short time later (when the patient was taking iodide of potassium), lead was found to be present in small amount.

On December 1st he was ordered iod. pot. gr. v, 3 t. d., which was omitted December 20th, and again given, this time in doses of gr. x, 3 t. d., from January 1st to January 10th. Other than this, and an occasional cathartic or opiate, he took no medicine while in the hospital. From January 1st to January 5th, when he was discharged, his spinal cord was galvanized daily.

He improved constantly while in the hospital, and at his discharge could walk much better without his cane than previously with it. The tracings were taken on the 15th, 28th, and 31st of January, and the 1st and 4th of February.

Prof. Traube, of Berlin, has described two varieties of rhythmically irregular pulses[1] analogous to this, which he has called the *pulsus bigeminus* and the *pulsus alternans*.[2] In the

[1] "Beiträge zur Pathologie und Physiologie," Bd. I., pp. 373, 448, and others.

[2] *Berliner Klin. Wochenschr.*, 1872, Art. "Pulsus Bigeminus." Compare also the accompanying tracing.

first variety, each two pulsations is followed by a relatively long period of rest; in the second, alternately strong and weak pulsations follow each other in regular succession, somewhat as in tracing No. 1 in this case.

The first variety had been observed by him a few times in the case of persons dying of acute disease, a short time before death, being followed by the slow pulse (*pulsus tardus*) that ushered in the death of the left ventricle, but more frequently in the case of animals on which he was experimenting, and always under certain conditions: viz., when the inhibitory nervous centres of the heart were strongly stimulated by some agent circulating with the blood, and when at the same time the influence of the centres situated in the medulla oblongata was removed by section of the vagi, or had become weakened in consequence of over-stimulation, and the centres situated within the heart itself alone left active. For example, it was observed when a curarized animal, kept alive by artificial respiration, was injected by digitalis, and then the vagi cut; or was partially suffocated by stopping the artificial respiration until sufficient carbonic acid had collected to poison the spinal inhibitory centres, which give way before the proper cardiac centres.

Other heart-poisons, such as nitrate of potash, or cyanide of potassium, acted similarly to digitalis and carbonic acid.

Prof. H. P. Bowditch, of Harvard Medical College, had observed the phenomenon occasionally both with dogs and rabbits, subjected to various experiments, and it was interesting to find that the best instances occurring among a number of old tracings which he was kind enough to examine for me, were in cases where the animal, kept alive by artificial respiration, was allowed to partially suffocate, just as in Traube's cases. In the best-marked instance the pulsus bigeminus was followed very soon by the pulsus tardus of impending death, which was, however, avoided by the renewal of the respiration.

The pulsus alternans was observed by Traube in the case of a patient suffering from valvular disease of the heart, toward the close of the disease, and while the patient was taking digitalis in moderately large doses.

Traube believed that the same general conditions underlie this variety of rhythmical irregularity of the pulse as were observed in the case of the pulsus bigeminus. The stimula-

tion of the cardiac inhibitory centres was supposed to be effected by the digitalis, while the depressing effect of the disease itself, to which the patient shortly after succumbed, was believed to cause a partial paralysis of the spinal inhibitory centres, as was shown also by the fact that even large doses of digitalis could not bring down the number of beats below 108 per minute.

With the increasing feebleness of the patient, the pulsus alternans grew less marked, and finally disappeared altogether.

The tracings taken from the present patient are examples of what might be called pulsus alternans, bigeminus (though not answering exactly to Traube's definition), and trigeminus. They tell their own story, and only a few words more are necessary in explanation of them, and to sum up the case.

The character of the pulse, although changing as it did from day to day, did not ordinarily vary much during the time of the single observations. Only on the 4th of February, when the patient felt very poorly and had a weak and slow pulse, without the usual characteristics, the tracings differ a good deal among themselves. The peculiar irregularities of the pulse were not, however, always most marked when the patient felt the worst.

As the record shows, the system was not under the influence of iodide of potassium when any one of the tracings was taken.

It will be seen that the stronger beats are generally followed and preceded by somewhat longer rests than the shorter ones, as was also the case with Traube's patient with the pulsus alternans.

Especially on looking at the tracing No. 3, *a*, where the force of the beats grows gradually less, and then gradually greater, the mind reverts to the rhythmical irregularity of the respiration known as the Cheyne-Stokes respiration, for which to be sure Traube himself has given an apparently sufficient explanation, which seems entirely inapplicable here.

It may be added that the rhythm of the respiration in this case stood in no fixed relation to that of the pulse.

The occupation of our patient, and especially the presence of lead in his urine, leads us to suspect chronic lead-poisoning as the cause of at least part of his symptoms—the indefinite, deep-seated pains in the posterior fleshy parts of the thighs,

and in or about the hip-joints, especially the left, of a dull character, and not shifting their place rapidly like rheumatic pains—the muscular tremors, the general feebleness of the whole system, and the slight want of control over the legs.

As to the peculiar irregularity in the heart's action, it is difficult to explain it in the manner adopted by Traube, although, when we come to know more of the action of lead upon the system, we may be able to do so.

It is also highly probable that the inhibitory centres for the heart are frequently affected in chronic lead-poisoning. Many observers, but especially Tanquerel, have found the pulse somewhat slow throughout the disease, but particularly during the attacks of colic, when the number of beats often falls to 30 or 40.

On the other hand, instead of being slow, it is sometimes more rapid than normal, 80–100.

In this case the pulse was generally quick, 80–100, full and strong.

On April 2d, however, it was rather slow, 70–75, very feeble and irregular, and changing its character from minute to minute, and it was noticeable that on that day the usual irregularity was scarcely to be detected (*vide* tracings No. 4, *a* and *b*).

I have not been able as yet to find a case of lead-poisoning that presented exactly the rhythmical irregularity of the pulse observed here. Tanquerel, however, whose experience embraced 1,200 cases and more, observed very frequently irregularities, of one sort or another, during the attacks of colic (which may last for days and weeks).

He says:[1] . . . "For some moments the pulsations succeed each other with an astonishing rapidity, then suddenly they sensibly diminish, and so on. . . . Generally when the pulse is irregular, it is not hard, it often beats from 60–80 times in a minute, it is rarely slow."

Whether the irregularity of the pulse in the case of this patient can be brought into a parallel, *etiologically*, with those of Traube or not, it is certain that it does not have the same *prognostic* meaning.

It has existed for nearly a year, during which time the patient has alternately gained and lost ground, and did not diminish at the time of his marked improvement in the hospital.

[1] Translation by S. L. Dana, 1848, p. 94.

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